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**SmartGlove Cloud Platform for Parkinson's
Patients Data Collection & Analysis**

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Abstract

Parkinson's disease is a neurodegenerative disorder that affects millions of individuals worldwide. To aid in the diagnosis, monitoring, and treatment of Parkinson's patients a comprehensive platform has been developed, comprising a characterized database and a user interface (UI) for data access, visualization, and monitoring. The platform utilizes sensor signal recordings acquired using a smart glove for the automatic assessment of the patients' motor status.

1 Introduction

Parkinson's disease is a chronic neurodegenerative disorder characterized by motor symptoms such as tremors, rigidity, and bradykinesia. As the disease progresses, these symptoms worsen, significantly impacting the quality of life of affected individuals. Traditional methods for monitoring Parkinson's patients primarily rely on subjective clinical assessments, leading to potential inaccuracies and limited understanding of disease progression. However, advancements in technology, including the use of smartphones, have opened new avenues for objective and continuous monitoring of patients. Innovative devices, such as smart gloves equipped with sensors [1] [2], offer the ability to collect precise and quantitative data on motor function [3]. Cloud platforms provide scalable and secure environments for managing the vast amount of data generated by Parkinson's patients. By leveraging cloud infrastructure, researchers and clinicians can access, analyze, and store sensor signal recordings and processed results efficiently.

2 The SmartGlove Cloud Platform

The proposed platform serves as a secure and intuitive cloud-based solution for storing and analyzing patient data. By establishing communication with the mobPark application, the platform facilitates the retrieval of patient records, including data from the SmartGlove device, questionnaire responses, and test results obtained through gaming applications. Additionally, the platform offers an interactive interface for

users to access, visualize, and compare the collected data. It also acts as a Decision Support System, providing therapeutic suggestions, medical alerts, and additional medical data to enhance clinical decision-making and patient management.

To utilize the central management platform, both medical staff and patients are required to authenticate using assigned usernames and passwords. This authentication process ensures secure access to the platform's features, particularly the SmartGlove functions. Access to SmartGlove features is only possible with valid credentials. User authentication encompasses two distinct categories: 1) Patients access the platform's services through the SmartGlove application.

Their authentication is performed within the application using the provided API from the platform. 2) Medical Staff and System Administrators access the central platform directly. They authenticate themselves using their designated usernames and passwords, enabling them to leverage the platform's comprehensive functionalities.

The Central Platform is built in PHP, the popular language for dynamic web content. It utilizes the Yii2 Framework, offering a convenient starting point for development and supporting the Model-View-Controller (MVC) architecture. Yii2 integrates HTML5, Bootstrap CSS, and JavaScript, enhancing the platform's capabilities. It is cloud-based, offering availability and scalability (Fig. 1). It eliminates the need for hardware equipment and reduces capital expenditures. The cloud environment includes a public and private subnet, with communication through an internet gateway. The public subnet consists of a load balancer for workload balancing and a NAT gateway for secure traffic redirection to the private subnet. This cloud-based approach ensures flexibility, scalability, cost-effectiveness, and strong security measures. Within the private subnet, the web server facilitates user interaction with the system. Users can authenticate and interact through two methods: via the API for patients using the mobPark application and through the web application's corresponding screens. Additionally, the system includes a Processing Unit responsible for the intelligent functionality. It is divided into two main parts. The first part involves training models for automatic patient evaluation, while the second part focuses on implementing the computerized system.

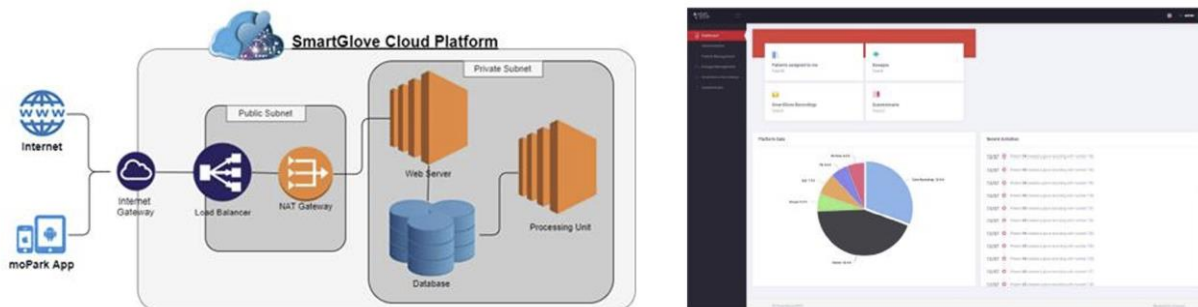


Figure 1. (a) SmartGlove Cloud Architecture, and (b) Main Dashboard.

3 Discussion

Overall, the proposed platform facilitates the creation of a standardized and accessible resource for sensor signal recordings from Parkinson's patients. This enables collaborative research efforts, facilitates data sharing, and promotes the development of predictive models and personalized interventions. Furthermore, cloud-based storage ensures data durability and availability, minimizing the risk of data loss

and providing a foundation for long-term studies and continuous monitoring. By combining advanced data processing techniques and an intuitive UI, the proposed cloud platform holds great potential for advancing our understanding of Parkinson's disease and improving the management of affected individuals.

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5 References

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